CLAIMS

1. A simulation method for creating a virtual three-dimensional scene illuminated with at least one lighting fixture, said method comprising the steps of:

a) obtaining an object data with regard to a three-dimensional object to be illuminated with said lighting fixture;

b) specifying said lighting fixture and determining a position of said lighting fixture within a space of said three-dimensional object, in order to obtain output characteristic data as well as positional data of said lighting fixture;

c) transforming said object data into an array of discrete elements and obtaining object color component values inherent to each discrete element, said object color component values being assigned to respective color components in a predetermined color space for designating the color of each discrete element;

d) processing said object data, and said output characteristic data as well as said positional data of said lighting fixture in order to obtain lamp color component values given to each of said discrete elements, said lamp component values being assigned to the respective color components in said color space for designating the color of said lighting fixture illuminating each destined one of the discrete elements,

e) providing a plurality of lamp-by-element tables each associated with each of said discrete elements, each of said lamp-by-element table storing the lamp color component values;

f) varying at least one of said output characteristic data and said positional

data of said lighting fixture;

g) determining the discrete elements to be illuminated by said lighting fixture;

h) referring to said lamp-by-element tables only associated with thus determined discrete elements and modifying the lamp color component value stored in the referred lamp-by-element tables as a function of said output characteristic data and said positional data being varied;

i) allocating said modified color component values to each of the corresponding discrete elements and combining the modified color component values to said object color component values of each discrete element to realize an updated color distribution over the entire array of said discrete elements; and

j) processing said updated color distribution for rendering a view of three-dimensional illuminated scene of said object.

2. A simulation method as set forth in claim 1, wherein

two or more lighting fixtures are selected and specified with respect to said output-characteristic data as well as said positional data,

said method including the steps of

i. selecting two or more said lighting fixtures as variable components, and varying at least one of said output characteristic data and said positional data of said lighting fixtures to determine the discrete elements to be illuminated by said lighting fixtures selected as the variable components;

ii. referring to said lamp-by-element tables only associated with thus determined discrete elements and modifying the lamp color component

values stored in the referred lamp-by-element tables for said lighting fixtures;

iii. summing the lamp color component values in each of the referred lamp-by-element table to give summed lamp color component values associated with each said discrete element, and allocating the summed lamp color component values to said discrete elements, thereby realizing the updated color distribution over the array of the discrete elements.

3. A simulation program for creating a virtual three-dimensional scene illuminated with multiple lighting fixtures, said program being adapted to be stored in a recordable medium for execution at a computer and comprising:

a) an input module which provides an input interface for entry of an object data with regard to a three-dimensional object to be illuminated with said lighting fixtures;

b) a lamp setting module which provides a lamp setting interface for selecting one or more said lighting fixtures and determining position of said selected lighting fixtures within a space of said three-dimensional object,

c) a lighting data processing module which gives output characteristic data and positional data of said selected lighting fixtures in response to the selection of said lighting fixture and the position thereof received at said lamp setting interface;

d) an object processing module which transforming said object data into an array of discrete elements, and which obtains object color component values inherent to each discrete element, said object color component

values being assigned to respective color components in a predetermined color space for designating the color of each discrete element;

e) a reference data generating module which calculates said object data, and said output characteristic data as well as said positional data of each of said selected lighting fixtures in order to obtain lamp color component values given to each of said discrete elements, said lamp component values being assigned to the respective color components in said color space for designating the color of said lighting fixture illuminating each destined one of the discrete elements, said reference data generating module providing a plurality of lamp-by-element tables each corresponding to each one of said discrete elements and storing the lamp color component values;

f) a lighting control module which provides a lighting control interface for selecting at least one of said lighting fixtures and selecting changes in at least one of said output characteristic data and said positional data of the lighting fixture;;

g) a re-calculation module which determines the discrete elements to be illuminated by said at least one lighting fixture, and refers to said lamp-by-element tables only associated with thus determined discrete elements, said re-calculation module modifying the lamp color component values stored in the referred lamp-element tables as a function of said output characteristic data and said positional data being varied;

h) a color allocating module which allocates said modified color component values to each corresponding one of said discrete elements and combines the modified color component values to said object color component

values of each discrete element to thereby realize a an updated color distribution over the entire array of said discrete elements,

i) an image producing module which processes said updated color distribution for rendering a view of three-dimensional illuminated scene of said object, and generating an image signal for presenting said view on a display.

4. A simulation system for creating a virtual three-dimensional scene illuminated with one or more lighting fixtures, said system comprising:

a) an input interface for entry of an object data with regard to a three-dimensional object to be illuminated with said lighting fixtures;

b) a lamp setting interface for selecting one or more said lighting fixtures and for determining position of said selected lighting fixtures within a space of said three-dimensional object,

c) a lighting data processing unit which gives output characteristic data and positional data of said selected lighting fixtures in response to the selection of said lighting fixture and the position thereof received at said lamp setting interface;

d) an object processing unit which transforms said object data into an array of discrete elements, and which obtains object color component values inherent to each discrete element, said object color component values being assigned to respective color components in a predetermined color space for designating the color of each discrete element;

e) a reference data generating unit which calculates said object data, and

said output characteristic data as well as said positional data of each of said selected lighting fixtures in order to obtain lamp color component values given to each of said discrete elements, said lamp component values being assigned to the respective color components in said color space for designating the color of said lighting fixture illuminating each destined one of the destined discrete elements,

f) a memory providing a plurality of lamp-by-element tables each corresponding to each one of said discrete elements and storing the lamp color component values;

g) a lighting control interface for selecting at least one of said lighting fixtures and selecting changes in at least one of said output characteristic data and said positional data of the lighting fixture;

h) a re-calculation unit which determines the discrete elements to be illuminated by said at least one lighting fixture, and refers to said lamp-by-element tables only associated with thus determined discrete elements, said re-calculation unit modifying the lamp color component values stored in the referred lamp-element tables as a function of said output characteristic data and said positional data being varied;

i) a color allocating unit which allocates said modified color component values to each corresponding one of said discrete elements and combines the modified color component values to said object color component values of each discrete element to thereby realize a an updated color distribution over the entire array of said discrete elements, and

j) an image producing unit which processes said updated color distribution for rendering a view of three-dimensional illuminated scene of said object,

and generating an image signal for presenting said view on a display.

5. The system as set forth in claim 4, wherein

said re-calculation unit includes a filter that retrieves the output characteristic data and said positional data of the lighting fixtures selected at said lamp setting interface, and determines which one or ones of said discrete elements are assigned to have the lamp color components values each of a sufficient level above a threshold, and defining thus determined discrete elements as active elements, said filter enabling said re-calculation unit to refer to said lamp-by-element tables only associated with the active elements.

6. The system as set forth in claim 4, wherein

said image producing unit includes a viewpoint selector which provides multiple viewpoints for said three-dimensional illuminated scene of said object, and selects anyone of said viewpoints in generating said image signal for presenting said view on the display.

7. The system as set forth in claim 4, wherein

said image producing unit produces the view of the three-dimensional illuminated scene of said object each time said re-calculating means operates to modify the lamp color component values, and generates the image signals in succession for presenting said views as a movie.

8. The system as set forth in claim 6, further including
a raster memory that records the series of said image signals for replaying said movie.

9. The system as set forth in claim 8, further including a control output interface for connection with the actual lighting fixtures, said control output interface processing said image signals recorded in said raster memory to generate a control signal for actuating the lighting fixtures in coincidence with the changes made for at least one of said output characteristic data and said positional data of said lighting fixtures selected at said lighting control interface.

10. The system as set forth in claim 4, further including
a lighting data input interface for receiving a control input which selects one or more of said lighting fixture, and describes a lighting schedule indicating a time-series of changes intended for at least one of said output characteristic data and said positional data of the selected lighting fixture,
said data input interface transmitting said control input to said re-calculating unit for modifying the lamp color component values in accordance with the lighting schedule.